



Towards OSL-thermochronology, a new thermochrometer of very low closure temperature

Frédéric Herman (1), Benny Guralnik (1), Frank Preusser (2), Sally Lowick (2), and Edward Rhodes (3)
(1) ETH Zurich, Switzerland, (2) University of Bern, Switzerland, (3) University of California Los Angeles, USA

Thermochronology is the study and measurement of the time-temperature history of rocks during cooling. In practice, it provides estimates of the time since the rocks passed through a given closure temperature window. Given that the thermal field of the uppermost crust is sensitive to the topography, systems of low closure temperature can provide information on the history of surface evolution as well as timing of tectonic processes. As a consequence, systems such as apatite (U-Th)/He dating, which has a closure temperature of about 700°C, have received widespread development and application. Recently, a novel thermochronologic method, based on optically stimulated luminescence (OSL) dating has been introduced (Herman et al., 2010). This innovative approach appears to have a closure temperature of about 30-40 °C, opening a new window of research on the latest stage of exhumation of rocks towards the surface. This system has the potential to enable quantification of geologic and/or geomorphic processes at a timescale comparable to that of Quaternary climate cycles. Besides its remarkable thermal properties, OSL-thermochronology also has the advantage of the relative ease of making measurements and the ubiquity of the minerals used: quartz, feldspar and potentially zircon.

We present here a series of luminescence measurements made on samples from the KTB borehole in Germany and the Southern Alps of New Zealand. The results of the analysis from the KTB samples exhibit a clear temperature dependence: samples from temperature lower than 30 °C are saturated while those from higher temperature are reset. The samples from New Zealand illustrate how this new technique can be used to constrain rates of erosion and relief change within a single glacial cycle.

Herman F., E.J. Rhodes, J. Braun and L. Heiniger (2010) Uniform erosion rates and relief amplitude in the Southern Alps of New Zealand, as revealed from OSL-thermochronology. *Earth and Planetary Science Letters*, doi:10.1016/j.epsl.2010.06.019